Support in Applicants' Parent Appln. Ser. No. 461,684 filed on 1/8/90 U.S. Patent No. 5,209,723 to Twardowski et al.	Fig. 2; col. 4, lines 51-61. Figs. 1 and 3; col. 6, lines 28-44.	Figs. 1, 3, and 4, col. 5, lines 27-33.	Figs. 1, 5, and 6; col. 4, lines 55-59; col. 7, lines 1-30.
Support in Applicants' Present <u>Specification</u>	Fig. 2; p. 14 Figs. 1 and 3; pp. 18-19.	Figs. 1, 3, and 4; p. 16.	Figs. 1, 5, and 6; pp. 14, 20, and 21.
Applicants' <u>Claims</u>	1. A catheter for hemodialysis which comprises a flexible catheter tube defining a plurality of separate lumens, said catheter defining an arc angle of generally U-shape in its natural, unstressed	said catheter may be implanted with a distal catheter portion residing in a vein of a patient, said distal catheter portion being of substantially the shape of said vein in its	condition, and a proximal catheter portion residing in a surgically created tunnel extending from said vein and through the
U.S. Patent No. 5,156,592 to Martin et al.	1. A flexible catheter for prolonged vascular access, the catheter comprising: an elongate flexible and tubular body having a proximal portion, a distal portion and a permanently curved portion linking the	proximate and distractions so that the curved, the proximal and the distal portions lie naturally in essentially the same plane with the angle contained between the proximal and distal portions being less than	extending continuously through said portions and lying substantially at right angles to said plane to divide the

u		ď
U.S. P	156	rt

generally D-shaped intake curved portion to receive and outlet lumens; intake of the distal portion and outlet tubes coupled at a proximal end of the supply outgoing fluid to tip formed on the distal to the proximal portion the outlet lumen; and a incoming fluid from the returning the outgoing receiving the incoming fluid and at least one including at least one intake opening for body remote from the intake lumen and to outlet opening for cubular body into fluid. end and

portion, a distal portion comprising: an elongate flexible and tubular body curved, the proximal and A flexible catheter for prolonged vascular and permanently curved portions so that the access, the catheter portion linking the proximal and distal having a proximal

Applicants' Claims

catheter and blood may be through one lumen of the through another lumen of removed from said vein returned to said vein whereby blood may be skin of the patient, the catheter

Specification Applicants Support in Present

5,209,723

to Twardowski Patent No. filed on

U.S.

1/8/90

Support in Applicants

Ser. No. 461,684

Parent Appln.

3, and 4; p. 2.

Figs. 1,

Figs: 1, 3, and 4; col. 1, lines 31-35.

flexible and tubular body portion, a distal portion A flexible catheter an elongate and a permanently curved curved, the proximal and 19. A flexible carrier for prolonged vascular portions so that the access, the catheter portion linking the proximal and distal having a proximal comprising:

3 and 4; col lines 34-46 Figs. Figs. 3 and 4; pp. 18-19

No	to	7
int	2	rd
ate		e
ă	26	
ŝ		rt
D.	S	Ma

curved portion to receive of the distal portion chrough said portions and generally D-shaped intake and outlet lemens; intake at a proximal end of the supply outgoing fluid to cip formed on the distal naturally in essentially and outlet tubes coupled portions being less than to the proximal portion the outlet lumen; and a incoming fluid from the the same plane with the angle contained between the distal portions lie the proximal and distal one intake opening for receiving the incoming fluid and at least one extending continuously ying substantially at and including at least returning the outgoing right angles to said plane to divide the body remote from the intake lumen and to outlet opening for cubular body into 90°, and a septum end

Applicants,

through said portions and receive incoming fluid from the intake lumen and generally D-shaped intake portion at a proximal end to supply outgoing fluid to the outlet lumen; and portion and including at east one intake opening naturally in essentially portions being less than east one outlet opening distal end of the distal intake and outlet tubes the distal portions lie the same plane with the angle contained between of the body remote from the proximal and distal coupled to the proximal extending continuously lying substantially at the curved portion to incoming fluid and at right angles to said plane to divide the a tip formed on the and outlet lumens; 90°, and a septum tubular body into or receiving the for returning the outgoing fluid.

Specification Applicants' Support in Present

5,209,

to Twardow<u>sk</u>i U.S. Patent No.

filed on 1/8/90

Ser. No. 461,684 Parent Appln.

Support in Applicants'

2; col. 4, lines 60 Fig.

Fig. 2; page 14

Figs. 5-6; col. 7, lines 1-29.

5-6; pp. 20-21 Figs.

Col. 1, lines 32-36

Figs. 1 and 3; col. 2, lines 22-52, col. 4, 1 60 to col. 5, line 12

Figs. 1 and 3; pp.

Support in Applicants" Parent Appln. Ser. No. 461,684 filed on 1/8/90 U.S. Patent No. 5,209,723 to Twardowski et al.	Fig. 2.	Figs. 1 and 5.	Figs. 1, 3, and 4; col. 5, lines 35-43. (Cuffs 42, 42a, 42b.)	Figs. 1, 3, and 4; col. 5, lines 35-43. (Cuffs 42, 42a, 42b.)
Support in Applicants' Present <u>Specification</u>	Fig. 2.	Figs. 1 and 5.	Figs. 1, 3, and 4; p. 16. (Cuffs 42, 42a, 42b).	Figs. 1, 3, and 4; p. 16. (Cuffs 42, 42a, 42b.)
Applicants' <u>Claims</u>	20. The flexible catheter of claim 19 in which said portions are round in cross-section.	catheter of claim 20 in which the diameter of the proximal portion is greater than the diameter of the distal portion.	catheter of claim 21 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.	23. The flexible catheter of claim 20 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.
U.S. Patent No. 5,156,592 to Martin et al.	2. A flexible catheter as claimed in claim 1 in which said portions are cound in cross-section.	1. A flexible catheter 18 claimed in claim 2 in which the diameter of the proximal portion is greater than the diameter of the distal portion.	i. A flexible catheter is claimed in claim 3 and curther comprising a cuff of fibrous material urrounding the body where the proximal cortion meets the curved cortion.	i. A flexible catheter is claimed in claim 2 and curther comprising a cuff of fibrous material surrounding the body where the proximal cortion meets the curved cortion.

			Support in Applicants' Parent Appln.
<pre>U.S. Patent No. 5,156,592 to Martin et al.</pre>	Applicants' <u>Claims</u>	Support in Applicants' Present <u>Specification</u>	Ser. No. 461,684 filed on 1/8/90 U.S. Patent No. 5,209,723 to Twardowski et al.
6. A flexible catheter as claimed in claim 1 and further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved	24. The flexible catheter of claim 19 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.	Figs. 1, 3, and 4; p. 16. (Cuffs 42, 42a, 42b.)	Figs. 1, 3, and 4; col. 5, lines 35-43. (Cuffs 42, 42a, 42b.)
as claimed in claim 1 in which the at least one intake opening at the end of the intake lumen and in which the tip includes a generally cylindrical extension blending amoothly into the body and forming an extension to the return lumen.	25. The flexible catheter of claim 19 in which the tip includes an extension blending smoothly into the body and forming an extension to the outlet lumen.	Fig. 1; p. 15; Figs 7-8.	Fig. 1; col. 4, line 65 to col. 5, line 6; Figs. 7-8.
8. A flexible catheter as claimed in claim 7 in which the at least one intake opening is at a side of the distal portion facing the proximal portion, and in which the culindrial	26. The flexible catheter of claim 25 in which the at least one intake opening is at a side of the distal portion facing the proximal portion, and in which the catheter is a side of the distal portion facing the proximal portion, and in which the catheter is a side of the cathe	Fig. 1.	Fig. 1.

which the extension is at

portion remote from the a side of the distal

extension is at a side of the distal portion remote

from the proximal

portion.

proximal portion, and in which the cylindrical

proximal portion.

			•	
Ser. No. 461,684 filed on 1/8/90 U.S. Patent No. 5,209,723 to Twardowski et al.	Figs. 1-5.	Figs. 1 and 5.	Figs. 3 and 4; col. 6, lines 34-44. Note that the "almost 180° arc angle" disclosed in this patent is substantially the same as an "angle" of near 0° as the angle is defined in this claim.	Figs. 1, 3, and 4; col. 5, lines 35-43. (Cuffs 42, 42a, 42b.)
Support in Applicants' Present Specification	Figs. 1-5.	Figs. 1 and 5.	Figs. 3 and 4; pp. 18-19. Note that the "almost a 180° arc angle" disclosed in this application is substantially the same as an "angle" of near 0° as the angle is defined in this claim.	Figs. 1, 3, and 4; p. 16. (Cuffs 42, 42a, 42b.)
Applicants' <u>Claims</u>	27. The flexible catheter of claim 26 in which said portions are round in cross-section.	28. The flexible catheter of claim 27 in which the diameter of the proximal portion is greater than the diameter of the distal portion.	29. The flexible catheter of claim 28 in which said angle is in the range of 0°-20°.	30. The flexible catheter of claim 26 further comprising a cuff of fibrous material
U.S. Patent No. 5,156,592 to Martin et al.	9. A flexible catheter as claimed in claim 8 in which said portions are round in cross-section.	as claimed in claim 9 in which the diameter of the proximal portion is greater than the diameter of the distal portion.	11. A flexible catheter as claimed in claim 10 in which said angle is in the range of 0°-20°.	12. A flexible catheter as claimed in claim 8 and further comprising a cuff of fibrous material
			•	

Support in Applicants' Parent Appln.

surrounding the body where the proximal portion meets the curved portion.

surrounding the body
where the proximal
portion meets the curved
portion.

Support in Applicants' Parent Appln. Ser. No. 461,684 filed on 1/8/90 U.S. Patent No. 5,209,723	Fig. 1.	Figs. 1-5.	Figs. 1 and 5.	Figs. 3 and 4; col. 6, lines 34-44. Note that the "almost 180° arc angle" disclosed in this patent is substantially the same as an "angle' of near 0° as the angle is a fined in this claim.
Support in Applicants' Present Specification	Fig. 1.	Figs. 1-5.	Figs. 1 and 5.	Figs. 3 and 4; pp. 18-19. Note that the "almost a 180° arc angle" disclosed in this application is substantially the same as an "angle" of near 0° as the angle is defined in
Applicants' <u>Claims</u>	31. A flexible catheter of claim 19 in which the at least one intake opening is at a side of the distal portion facing the proximal portion, and in which the outlet opening is at a side of the distal portion remote from the proximal portion.	32. The flexible catheter of claim 31 in which said portions are round in cross-section.	33. The flexible catheter of claim 32 in which the diameter of the proximal portion is greater than the diameter of the distal portion.	34. The flexible catheter of claim 33 in which said angle is in the range of 0°-20°.
U.S. Patent No. 5,156,592 to <u>Martin et al.</u>	13. A flexible catheter as claimed in claim 1 in which the at least one intake opening is at a side of the distal portion facing the proximal portion, and in which the outlet opening is at a side of the distal portion remote from the proximal	14. A flexible catheter as claimed in claim 13 in which said portions are round in cross-section.	as claimed in claim 14 in which the diameter of the proximal portion is greater than the diameter of the distal portion.	<pre>16. A flexible catheter as claimed in claim 15 in which said angle is in the range of 0°-20°.</pre>

this claim.

the same as an "angle' of near 0° as the angle is defined in this claim.

Support in Applicants', Parent Appln. Ser. No. 461,684 filed on 1/8/90 U.S. Patent No. 5,209,723 to Twardowski et al.	Figs. 1, 3, and 4; col. 5, lines 35-43. (Cuffs 42, 42a, 42b.)	Fig. 5, col. 3, lines 11 18, col. 7, lines 4-14.
Support in Applicants' Present Specification	Figs. 1, 3, and 4; p. 16. (Cuffs 42, 42a, 42b.)	Fig. 5; p. 6 and 20.
Applicants' <u>Claims</u>	35. The flexible catheter of claim 31 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.	36. The flexible catheter of claim 19 in which the distal portion is sufficiently flexible to be deformed readily to follow the shape of a vein after entry, and in which the proximal portion is more rigid than the distal portion.
U.S. Patent No. 5,156,592 to Martin et al.	as claimed in claim 13 and further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.	as claimed in claim 1 in which the distal portion is sufficiently flexible to be deformed readily to follow the shape of a vein after entry, and in which the proximal portion is more rigid than the distal portion.

the same as an "angle" of the "almost 180° arc angle" disclosed in this patent is substantially near 0° as the angle is defined in this claim. Figs. 3 and 4; col. 6, lines 34-44. Note that Figs. 3 and 4; pp. 18-19. Note that the "almost a 180° arc angle" disclosed substantially the same as an "angle" of near 0° as the angle is defined in in this application is this claim.

catheter of claim 19 in

The flexible

37.

A flexible catheter as claimed in claim 1 in which said angle is in the range of 0° to 20°.

19.

the range of 0° to 20°. which said angle is in

A flexible catheter

Claims

flexible and tubular body portion, a distal portion through said portions and generally D-shaped intake and outlet lumens; intake and a permanently curved the distal portions lie naturally in essentially curved, the proximal and portions being less than and outlet tubes coupled at a proximal end of the the same plane with the angle contained between to the proximal portion the proximal and distal extending continuously for prolonged vascular lying substantially at portions so that the right angles to said plane to divide the access, the catheter portion linking the proximal and distal Eubular body into 90°, and a septum naving a proximal comprising:

Applicants'

comprising: an elongate flexible and tubular body portion, a distal portion and a permanently curved naturally in essentially portions being less than supply outgoing fluid to distal end of the distal proximal end of the body portion and including at A flexible catheter the distal portions lie the same plane with the angle contained between incoming fluid from the the proximal and distal for prolonged vascular 10°; intake and outlet remote from the curved proximal portion at a the outlet lumen; and portions so that the ubes coupled to the access, the catheter curved, the proximal portion linking the proximal and distal intake lumen and to a tip formed on the oortion to receive having a proximal

Applicants Support in Present

to Twardowski et a U.S. Patent No. Specification

Support in Applicants

Parent Appln.

filed on 1/8/90

461,684

Ser. No.

3 and 4; col. 6, Figs. 3 and lines 34-46 3 and 4; pp. 18-19

Figs.

Figs. 5-6; pp. 20-21

7, lines 5-6; col.

Col. 1, lines 32-36

Support in	Applicants'	Present	Specification
		Applicants'	Claims
	U.S. Patent No.	5,156,592 to	Martin et al.

curved portion to receive incoming fluid from the intake lumen and to supply outgoing fluid to the outlet lumen; and a tip formed on the distal end of the distal portion and including at least one intake opening for receiving the incoming fluid and at least one outlet opening for returning the outgoing

least one intake opening for receiving the incoming fluid and at least one outlet opening for returning the outgoing fluid.

U.S. Patent No. 5,209,7:
to Twardowski et al.
Figs 1 and 3. col 2

Figs. 1 and 3; pp. 4-5.

Support in Applicants

Parent Appln

Ser. No. 461,684 filed on 1/8/90

Figs. 1 and 3; col. 2, lines 22-52, col. 4, lines 60 to col. 5, line 12.